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[54] **INSOLE FOR SHOE**

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[52] **U.S. Cl.** **36/44**

[58] **Field of Search** ..... 36/44, 43, 76 C, 37, 36/69, 80; 128/595, 614, 615

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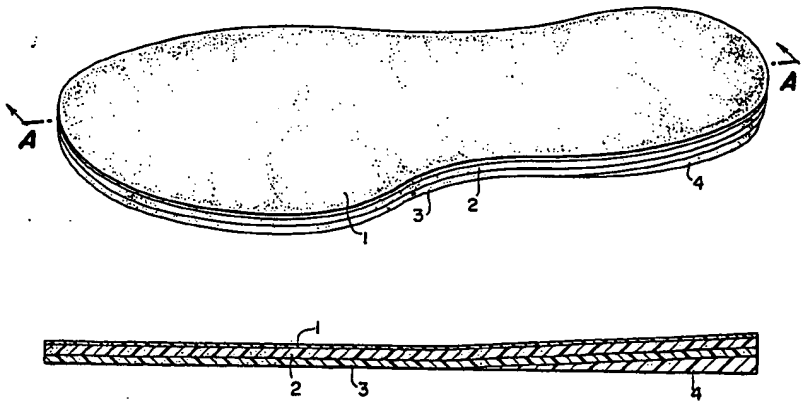
[57] **ABSTRACT**

An insole for use in athletic shoes comprises an upper layer, a lower layer laminated on the upper layer, and a shock-absorptive foamed material layer laminated on the underside of the lower layer at least at the heel portion. The upper layer has a hardness of 30°–50°, and the lower layer has a hardness of 50°–70°. The shock-absorptive foamed material layer has a hardness of 50°–80°.

3 Claims, 2 Drawing Figures



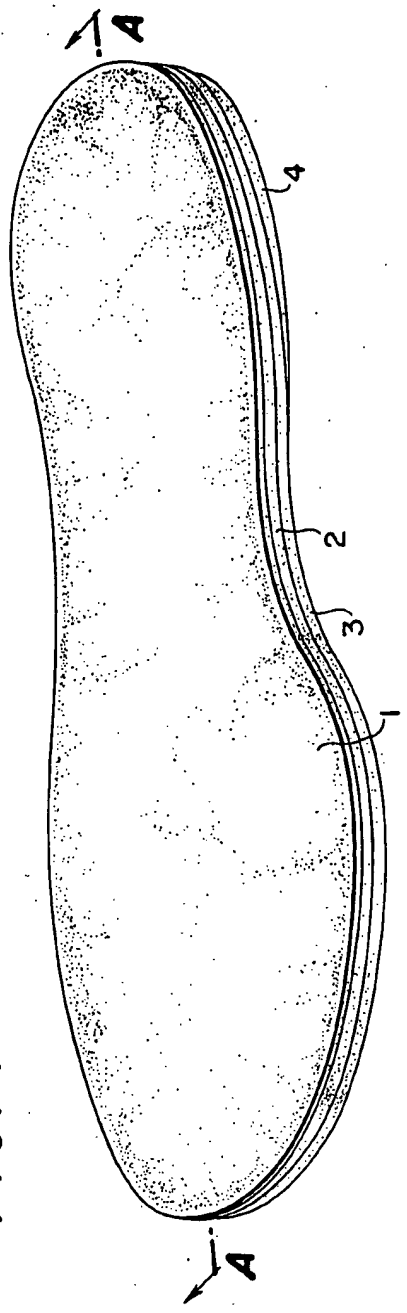


FIG. 1

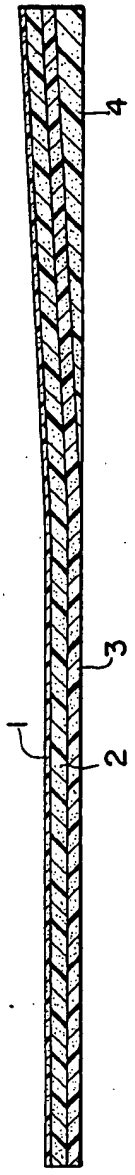


FIG. 2

INSOLE FOR SHOE

BACKGROUND OF THE INVENTION

The present invention relates to an insole for use in athletic shoes such as shoes for running, basketball, tennis and soccer and, more particularly, to an insole for use in such athletic shoes wherein stability of the foot and good comfort are also provided during use in such activities.

DESCRIPTION OF THE PRIOR ART

There are generally known insoles for use in such athletic shoes, comprising an elastic foamed material which is laminated on a facing formed of leather or fabric to impart cushioning during running. The human anatomy is such that when a person runs, at each step the rear portion of the heel of the foot makes the initial contact with the ground, followed by the heel proper, the outside edge of the foot adjacent to the arch, the ball of the little toe and the ball of the big toe in that order, and finally the big, second, third, fourth and little toe effect a toe-off motion. This motion of the foot is accompanied by a shift of the person's body weight thereon. It has been known that due to the cushioning of the elastic foamed material layer constituting a part of the prior art insole the foot is unstable, i.e., the shock from contact with the ground causes the foamed material layer to be compressed in the course of the initially contacting motion of the heel to the subsequent contacting motion of the foot. The subsequent rapid recovery of the elasticity allows the foot in the shoe, particularly the heel portion, to roll excessively inward, that is to say, to overpronate. Such overpronation causes trouble in the knee joint.

SUMMARY OF THE INVENTION

It is a general object of the present invention to provide an insole for use in athletic shoes, which overcomes the disadvantages of the prior art.

It is a further object of the present invention to provide an insole for use in athletic shoes, which provides stability of the foot and good comfort during running.

These objects are accomplished by an insole which comprises an upper layer having a hardness of 30°–50° (method of hardness test in accordance with SRIS-0101 (The Society of Rubber Industry, Japan Standard), (12.5°–28° shore A hardness) a lower layer having a hardness of 50°–70°(28°–47° shore A hardness), and a shock-absorptive foamed material layer which has a hardness of 50°–80° (28°–63° shore A hardness) and is laminated on the underside of the lower layer at least at the heel portion.

These and other objects and advantages of the present invention will become apparent from the following detailed description with reference to the accompanying drawings wherein:

FIG. 1 is a perspective view of an insole for use in athletic shoes according to the present invention; and

FIG. 1 is a sectional view of the insole taken along line A—A of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. 1 and 2, there is shown an insole for use in athletic shoes, which comprises an upper layer 2, a lower layer 3 laminated on the upper layer 2, and a shock absorptive formed material layer 4 laminated on the underside of the lower layer 3 at least at the heel portion.

In a preferred embodiment, each of the upper layer 2 and the lower layer 3 may be formed, as in the prior art insoles, of a foamed material including rubber foams such as usual natural rubbers and synthetic rubbers, for example, polyurethane rubber; and polyolefinic synthetic resin foams such as polyethylene and copolymer of ethylene with vinyl acetate (EVA).

However, the hardness of the upper layer 2 should be in a range of 30°–50° (method of hardness test in accordance to SRIS (The Society of Rubber Industry, Japan Standard) 0101) (12.5°–28° shore A hardness). If the hardness of the upper layer 2 is less than 30° (12.5° shore A hardness), the upper layer 2 will be too soft, thereby causing the form-maintaining property to be lost. When a person runs with the athletic shoes having the resulting insole therein, the sole of the foot sinks into the upper layer 2, resulting in a substantial reduction in comfort and in stability during running. If the hardness of the upper layer 2 exceeds the upper limit of 50° (28° shore A hardness), the cushioning will be reduced to cause a deterioration in comfort.

The hardness of the lower layer 3 should be in a range of 50°–70° (28°–47° shore A hardness), because a hardness thereof of less than 50° (28° shore A hardness) causes the form-maintaining function relative to the upper layer 2 to be lost. On the other hand, a hardness of the lower layer 3 exceeding 70° leads to a substantial reduction in the cushioning effect of the upper layer 2.

The shock-absorptive foamed material 4 means a viscoelastic material having a self-absorption and a reduced resilience as compared with a perfect elastomer. Such a reduction in resilience is due to the fact that vibrational shear deformation is converted to heat energy when the material is subjected to shock. Examples of such materials which are well known are those produced by foaming and bridging an elastomer material such as rubber, EVA, etc., with a blocking agent; and incompletely bridged urethane foams. The hardness of the foamed material 4 should be limited to a range of 50°–80° (28°–63° shore A hardness). With a hardness of less than 50° (28° shore A hardness), the foamed material 4 will be too soft, being easily compressed and deformed under a small force, resulting in incomplete shock-absorptive properties. On the other hand, a hardness exceeding 80° (63° shore A hardness) will be too hard, decreasing the compressive deformability and resulting in incomplete shock-absorptive properties. Preferably, the hardness of the shock absorptive foamed material 4 may be in a higher range of 70°–80° (28°–63° shore A hardness). When the hardness of the formed material layer 4 is set at 70° (47° shore A hardness) to 80° (28°–63° shore A hardness), the heel portion of the resulting insole gradually increases in hardness downwardly. Thus, the insole cushioning progressively decreases downwardly and progressively increases in its form maintaining properties, resulting in a further increase in comfort and a further increase in stability. Alternatively, the shock-absorptive foamed material layer 4 may be laminated over the entire lower surface of the lower layer 3, if required.

It is to be noted that on the surface of the upper layer 2 there is laminated a facing formed of a soft material such as fabric, leather, etc.

As mentioned above, the insole for use in athletic shoes according to the present invention comprises an

upper layer 2 and a lower layer 3 each of which is formed of an elastic foamed material. Between the upper and lower layers there is a difference in hardness within the above ranges. When a person wears the shoes with the insole inserted therein, the upper layer 2 preserves the cushioning, and the lower layer 3 provides a form-maintaining property relative to the upper layer 2, thus providing good comfort and good stability. The shock caused by the contact of heel with the ground during running is absorbed by the shock-absorptive foamed material layer 4 laminated on the lower layer 3 at the underside of the heel portion. Further, since the soft upper layer 2 is laminated over the shock-absorptive foamed material layer 4 with the hard lower layer 3 having a form-maintaining property being interposed therebetween, it cannot be excessively compressed by the shock from the ground, and the cushioning of the upper layer 2 is properly moderated. Thus, good comfort and good stability can be provided for the foot, and overpronation can be prevented, during running.

What is claimed is:

1. An insole for shoes, said insole comprising:
an upper layer formed of an elastic foamed material having a 12.5°–28° shore A hardness;
a lower layer formed of an elastic foamed material having a 28°–47° shore A hardness, said lower layer being laminated on a lower surface of said upper layer; and
a shock-absorptive foamed material layer having a 28°–63° shore A hardness, said shock-absorptive foamed material layer being laminated on a lower surface of said lower layer at the heel portion;
the heel portion increases in hardness from said upper layer to said lower layer and increases in hardness from said lower layer to said shock-absorptive foamed material layer.

2. An insole for shoes, said insole comprising:
an upper layer formed of an elastic foamed material having a 12.5°–28° shore A hardness;
a lower layer formed of an elastic foamed material having a 28°–47° shore A hardness, said lower layer being laminated on a lower surface of said upper layer;
a shock-absorptive foamed material layer having a 28°–63° shore A hardness, said shock-absorptive foamed material layer being laminated on the a lower surface of said lower layer only at the heel portion; and
the heel portion increases in hardness from said upper layer to said lower layer and increases in hardness from said lower layer to said shock-absorptive foamed material layer.

3. An insole for shoes, said insole comprising:
an upper layer formed of an elastic foamed material having a 12.5°–28° shore A hardness;
a lower layer formed of an elastic foamed material having a 28°–47° shore A hardness, said lower layer being laminated on a lower surface of said upper layer;
a shock-absorptive foamed material layer having a 28°–63° shore A hardness, said shock-absorptive foamed material layer being laminated on the a lower surface of said layer at least at the heel portion; and
the heel portion increases in hardness from said upper layer to said lower layer and increases a hardness from said lower layer to said shock-absorptive foamed material layer.

* * * * *

Means are provided for independently and adjustably modifying the support of the foot at each section location. Referring to FIG. 26, the modifying means may include independent pneumtic sections 468 which a user may puncture to a partially or fully deflat, as illustrated in FIG. 27. The modifying means could alternatively include independent mechanical retention elements which a user would push down and which would then stay in place at a position below the surface of the sections that the user has not pushed down.

It should be noted that the various embodiments of the present invention provide means to reduce shear forces on the sole of the foot. The grid pattern of resilient sections creates a multiplicity of sections that sway laterally independently of one another in response to forces applied by the foot. Typical soles simply resist lateral foot motion, thereby inducing shear stresses on the bottom of the foot which may cause or aggravate ulcers. Thus, in contrast to typical soles, the grid pattern of independently mobile resilient sections of the present invention constitutes means for reducing shear stresses on the bottom of a foot as the user walks along.

It should also be noted that inner sole assembly 52 may be worn interchangeably with either the right or left foot. So, for instance, a user may use the inner sole assembly to pad the left foot for a time, then later use it to pad the right foot. Likewise, the entire walker 12 may be designed to be worn interchangeably on either the right or left leg.

Concerning the dimensions of the removable sections, one operative and presently preferred embodiment of the invention employs hexagonal removable elements of the type shown in FIG. 2, with the hexagons having a distance between opposing faces of approximately ½". Larger or smaller removable sections could be employed; however, it is preferred that the sections have a linear extent less than ¾". In the presently preferred embodiment, the removable sections are resilient and each have a height that is greater than its width and depth.

In conclusion, a number of illustrative embodiments of the invention have been discussed hereinabove. However, it is to be understood that various changes and modifications may be made without departing from the spirit and scope of the invention. Thus, by way of example and not of limitation, the air bladder under the sole may be embedded in the soft goods member or may be located under it, between the soft goods support member 20 and the outer sole assembly 14. In addition, the optional bladder may be filled with a variety of fluids other than air, such as gel or water. The invention is, of course, applicable to other types of footgear, in addition to walkers, for example, athletic shoes or normal walking shoes. Accordingly, the present invention is not limited to the precise embodiments described hereinabove.

What is claimed is:

1. A walker with pressure relief areas for the foot of a user, said walker having a sole area extending substantially for the entire area underlying the foot of a user, comprising:

a walker frame including an outer sole and struts extending from said sole upward;

a soft goods support for enclosing the ankle, lower leg and at least a portion of the foot, said support being secured to said frame;

an inner sole mounted in said soft good support, said inner sole including an underlying flexible sheet extending substantially over the entire sole area; and an upper resilient inner sole member extending over and being removably secured to said underlying flexible sheet, said upper resilient inner sole member having a substantially uniform thickness and extending substantially over the entire sole area;

said upper resilient inner sole portion being composed of a plurality of at least 50 separate resilient sections arranged in a grid pattern, said sections being removably secured on their lower surfaces to said underlying flexible sheet and said sections together forming a substantially smooth surface for engagement by the foot, said sections being individually removable to provide localized pressure relief to selected areas of the foot; and

aid sections being directly adjacent one another to form said grid;

said grid pattern extending over substantially all of said upper inner sole member;

whereby one or a plurality of said sections may be removed at any desired area of the inner sole member to provide a relief zone corresponding to an afflicted zone of a foot.

2. A walker with pressure relief areas for the foot of a user, as defined in claim 1 wherein said upper resilient sole member includes at least 80 separate resilient sections.

3. A walker as defined in claim 1 wherein the inner sole portion has a central longitudinal axis, and wherein the inner sole portion is substantially symmetrical about said axis so that the walker may be used for either the left or the right foot and ankle of the user.

4. A walker as defined in claim 1 wherein said resilient sections are removably secured to said flexible sheet by hook and loop material; whereby said resilient sections may be easily removed and replaced.

5. A walker as defined in claim 4 wherein some of said separate resilient sections are taller than other of said sections so that a user may arrange said taller sections to custom fit a foot.

6. A walker as defined in claim 1 wherein said underlying flexible sheet is substantially indentation-free.

7. A walker as defined in claim 1 wherein some of said separate resilient sections are lower density sections and some are higher density sections so that a user may arrange said higher density sections to create at least one zone of additional support for a foot.

8. A walker as defined in claim 1 wherein said walker further comprises an additional resilient pad having an aperture and an adhesively-backed lower surface for attaching said additional pad to the upper surface of a plurality of said removable sections, said additional pad providing a region of additional support for a foot.

9. A walker as defined in claim 1 wherein said walker further includes an edema patch comprising a patch of stretch material having an adhesive layer on a lower surface thereof for adhering the edema patch to a top surface of removable sections surrounding a relief zone from which a user has removed other sections, such that the edema patch covers the relief zone.

10. A walker as defined in claim 9 wherein said edema patch further includes a fluid-impermeable film layer overlying said stretch material for preventing transmission of fluids through said edema patch.

11. A walker as defined in claim 1 wherein said walker further includes an edema patch comprising a patch of fluid-impermeable film having an adhesive layer on a lower surface thereof for adhering the edema patch to a top surface of sections surrounding a relief zone from which a user has removed other sections, such that the edema patch covers the relief zone.

12. A walker as defined in claim 11 wherein said edema patch further includes a layer of stretch material overlying said film patch.

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13. A walker as defined in claim 1 wherein said separate resilient sections are hexagonal.

14. A walker as defined in claim 1 wherein said inner sole includes a plurality of layers, with the layer closest to the foot being substantially softer and more resilient than other layers.

15. A walker as defined in claim 1 further comprising means connected to said support for extending around the instep to hold the foot back into said support and in engagement with said inner sole.

16. A walker as defined in claim 1 wherein said inner sole extends to the rear beyond the heel of a patient and upward along and to the rear of the foot of the user.

17. A walker as defined in claim 1 wherein hook and loop type fabric holds the support to the walker frame.

18. A walker as defined in claim 1 wherein said walker further comprises a bladder for containing air which is mounted in said walker above said outer sole, and wherein said inner sole is mounted above said bladder.

19. Footgear with pressure relief areas for the foot, said footgear having a sole area extending substantially for the entire area underlying the foot of a user comprising:

an outer sole;

an inner sole extending substantially over the entire sole area mounted in said footgear above said outer sole, said inner sole having a plurality of independently vertically movable sections arranged in a grid pattern, said independently vertically movable sections having lower surfaces which are mounted within said footgear and said sections together form a substantially smooth surface for engagement by the foot;

means for independently modifying support of the foot provided at each section location;

said resilient sections being directly adjacent one another to form said grid; and

said grid of resilient sections comprising substantially all of said inner sole and extending over substantially all of said sole area;

wherein said resilient sections have a height, a width and a depth, said height being greater than said width and depth.

20. Footgear as defined in claim 19 wherein said means for independently modifying the support of the foot comprises independent mechanical retention elements.

21. Footgear with pressure relief areas for the foot, comprising:

an outer sole;

an inner sole mounted in said footgear above said outer sole, said inner having a plurality of independently vertically movable sections arranged in a grid pattern, said independently vertically movable sections having lower surfaces which are mounted within said footgear and together form a substantially smooth surface for engagement by the foot;

means for independently modifying the support of the foot provided at each section location;

said resilient sections being directly adjacent one another to form said grid; and

said grid of resilient sections comprising substantially all of said inner sole;

wherein said resilient sections have a height, a width and a depth, said height being greater than said width and depth; and

said means for independently modifying the support of the foot comprising independent pneumatic sections which a user may puncture to deflate.

22. Footgear with pressure relief areas for the foot, said footgear having a sole area extending substantially for the entire area underlying the foot of a user, comprising:

an outer sole,

an inner sole extending substantially over the entire sole area mounted in said footgear above said outer sole, said inner sole having a plurality of removable sections that are removable mounted in said footgear and that are arranged in a grid pattern said removable sections having lower surfaces which are removable secured within said footgear and said sections together forming a substantially smooth surface for engagement by the foot said sections being individually removable from said footgear to provide localized relief to selected areas of the foot;

said resilient sections being directly adjacent to one another to form said grid, with substantially no space in between said sections except when at least one of said sections has been removed; and

said grid of resilient sections comprising substantially all of said inner sole and extending substantially over the entire sole area;

wherein said footgear further comprises a bladder for containing fluid, mounted in said footgear above said outer sole, and said removable sections are mounted in said footgear above said bladder.

23. Footgear with pressure relief zones for the foot, said footgear having a sole area extending substantially for the entire area underlying the foot of a user, comprising:

an outer sole;

an inner sole extending substantially over the entire sole area mounted in said footgear above said outer sole, said inner sole having a plurality of separate individually mobile resilient sections arranged in a grid pattern, said sections being removable secured on each of their lower surfaces to an underlying flexible sheet such that a user may disengage a lower surface of one or more of said sections from said flexible sheet for removal from said footgear, said resilient sections forming a surface for engagement by a foot;

said resilient sections being directly adjacent one another to form said grid and extending over substantially all of said sole area; and

an edema patch for covering an open space left after a user has removed at least one mobile section from said grid, said edema patch comprising an upper patch body having a lower surface and an adhesive layer on said lower surface for adhering said patch to mobile resilient sections surrounding the open space;

wherein said footgear further comprises a bladder for containing fluid, mounted in said footgear above said outer sole, and said resilient sections are mounted in said footgear above said bladder;

whereby one or a plurality of said adjacent sections may be removed at any desired area of the inner sole to provide relief corresponding to an afflicted zone of the foot, said edema patch being placed over the removed sections to apply pressure to the afflicted zone of the foot, thereby preventing fluids from building up therein.

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